CHAPTER 9

Sound Waves and Electromagnetic Radiation

CHAPTER CONTENTS

The howl of a wolf, the cry of a baby, the beat of a drummer — all of these sounds focus your attention and provide information about events in the world around you. More than any other mode of communication, sound evokes strong emotions — fear, concern, happiness, or excitement. Human ingenuity has fashioned sound into complex forms, such as language and music that are characteristic of cultures, nations, and generations. Sound is at the heart of who you are, what groups you bond with, and how you perceive yourself.

Vision, however, provides more than 80% of the information you receive about the world around you. You can read this book and see your classmates because light reflected from all of these objects reaches your eyes. Light is just one form of electromagnetic waves and what you learn about light applies to the entire electromagnetic spectrum.

Although you cannot see sound and electromagnetic waves as you can see water waves or waves on a large spring, they have similar properties. In this chapter, you will compare many facets of sound and electromagnetic waves and see how they relate to each other and to your previous knowledge about waves.

MULTI LAB

Properties of Sound and Light

TARGET SKILLS

- **Predicting**
- **Performing and recording**
- **Communicating results**

Sound from a Graduated Cylinder

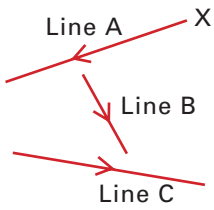
How can you make a 100 mL graduated cylinder produce different notes? Hold the open end of a clean graduated cylinder just below your lower lip and blow strongly across the top. Practise this a few times, until you can produce a sound consistently. Fill the cylinder about one third full of water, and blow again. Produce sounds with different water levels. Record what you hear each time.

Predict how the sound will change as you slowly fill the cylinder with water, while blowing across it. Now test your prediction.

Analyze and Conclude

1. Describe how the sound changes when you change the water level in the cylinder.
2. How can you make the sound louder?
3. What is vibrating to make the sound?
4. How did the sound change when you were adding water and blowing at the same time? Was your prediction correct?
5. Give a possible explanation for the change in the sound.

Reflection from Plane and Curved Mirrors



Draw and label three lines at random on a blank page, like the ones shown here. Mark arrows on each line to indicate a direction. Place a ray box at point X on line A, and shine a single light ray along the line. Position a plane mirror at the other end of line A, such that the reflected light ray touches the beginning of line B. Mark the position of the mirror, and draw in the light ray from A to B. Repeat for lines B and C, so that the final reflected light ray touches point X.

Analyze and Conclude

1. Find a pattern in the angles of the incident and reflected rays.
2. Repeat the procedure, using the concave and convex mirror shapes. Does the same relationship exist for the curved mirrors as for the plane mirror? Explain your answer.
3. What difficulties did you encounter measuring the angles?
4. Suggest a practical solution to the problem.